Claims

We claim:

1. A method for processing RF signals in a multi-antenna systems, comprising:

generating L_t input data streams in a transmitter;

modulating the L_t weighted input data streams to RF signals;

switching the RF signals to $t \geq L_t$ RF branches;

applying a phase-shift transformation to the RF signals by a $t \times t$ matrix multiplication operator $\mathbf{\Phi_1}$, whose output are t RF signals;

transmitting the t RF signals over a channel by t transmit antennas;

receiving the transmitted signals by r antennas in a receiver;

applying a phase-shift transformation to the r RF signals by a $r \times r$ matrix multiplication operator $\mathbf{\Phi_2}$;

selecting L_r branches from the r streams;

demodulated the L_r signal streams; and

processing in baseband to recover output data streams corresponding to the input data streams.

2. The method of claim 1, in which each of the L_t input data stream has a weight, and further comprising:

summing the L_r weighted data streams before the demodulating and decoding.

3. The method of claim 1, in which the L_t input data streams are generated by a space-time block coder.

4. The method of claim 1, in which the L_t input data streams are generated by a space-time trellis coder.

5. The method of claim 1, in which the input data streams are space-time layered structures.

6. The method of claim 1, in which $t = L_t$, and the matrix $\mathbf{\Phi_1}$ is an identity matrix.

7. The method of claim 1, in which $r = L_r$, and the matrix $\mathbf{\Phi_2}$ is an identity matrix.

8. The method of claim 1, in which entries of the matrix $\mathbf{\Phi_1}$ have constant modulus phase-only terms.

9. The method of claim 1, in which entries of the matrix $\mathbf{\Phi_2}$ have constant modulus phase-only terms.

10. The method of claim 1, in which entries of the matrices $\mathbf{\Phi_1}$ and $\mathbf{\Phi_2}$ have constant modulus phase-only terms.

11. The method of claims 8, in which the phase-only terms adapt to an estimate of an instantaneous channel state.

12. The method of claim 8, in which the phase-only terms adapt to an estimate of an average channel state.

13. The method of claim 1, in which the matrix $\mathbf{\Phi_1}$ is a fast Fourier transform matrix.

14. The method of claim 1, in which the matrix $\mathbf{\Phi_2}$ is a fast Fourier transform matrix.

15. The method of claim 1, in which the matrices $\mathbf{\Phi_1}$ and $\mathbf{\Phi_2}$ are fast Fourier transform matrices.